# United States Patent [19]

**Simon**

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[54] **PUNCH PIN HEAD STRUCTURE**


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[52] **U.S. Cl.** ..... **83/687**; 30/366; 83/441.1; 83/622; 83/626

[58] **Field of Search** ..... 30/360, 361, 366, 363, 30/164.5–164.8; 83/441.1, 626, 687, 622, 467, 686



[56] **References Cited**

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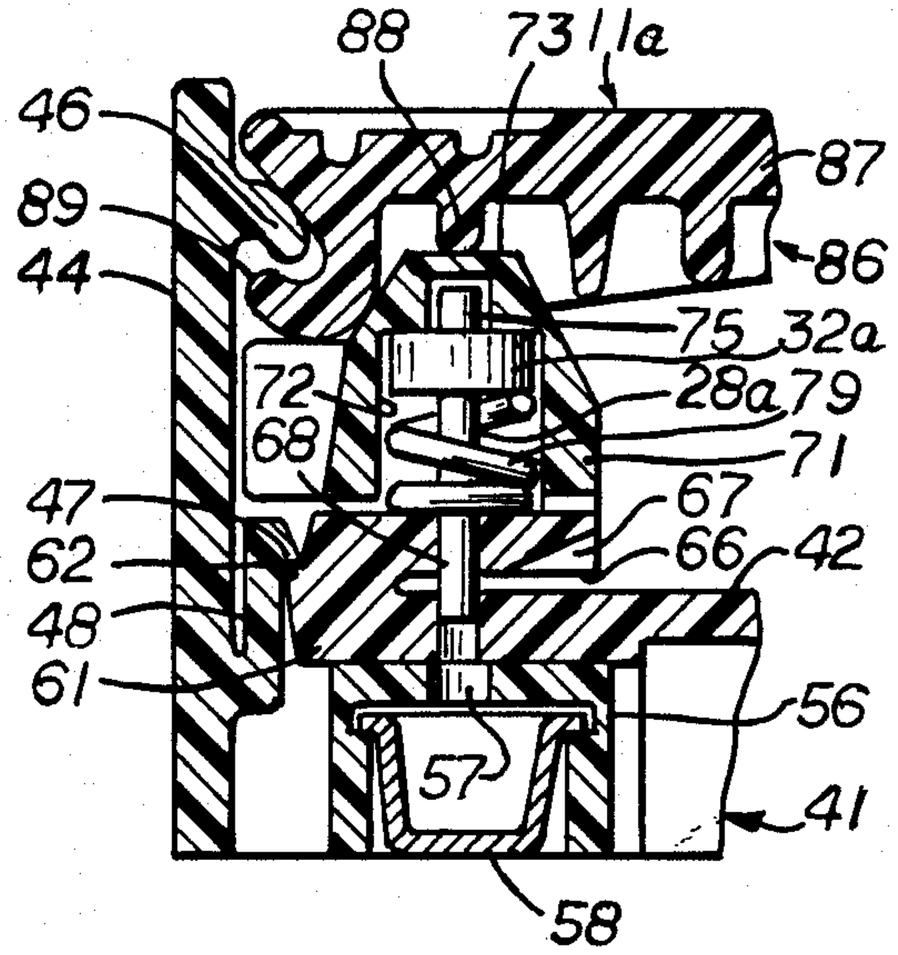
[57] **ABSTRACT**

Punches for paper and the like have a metal pin having a male punch element formed on one end and a pressure application area on the opposite end. To withdraw the punch pin an enlargement is formed at or near the opposite end, the enlargement cooperating with a gripper or a spring in the punch to cause the pin to retract when the pressure applicator retracts. In accordance with the present invention a circumferential groove is formed in the punch pin and a collar of plastic material is formed around the pin protruding into said groove and functioning as the enlargement.


**1 Claim, 5 Drawing Figures**



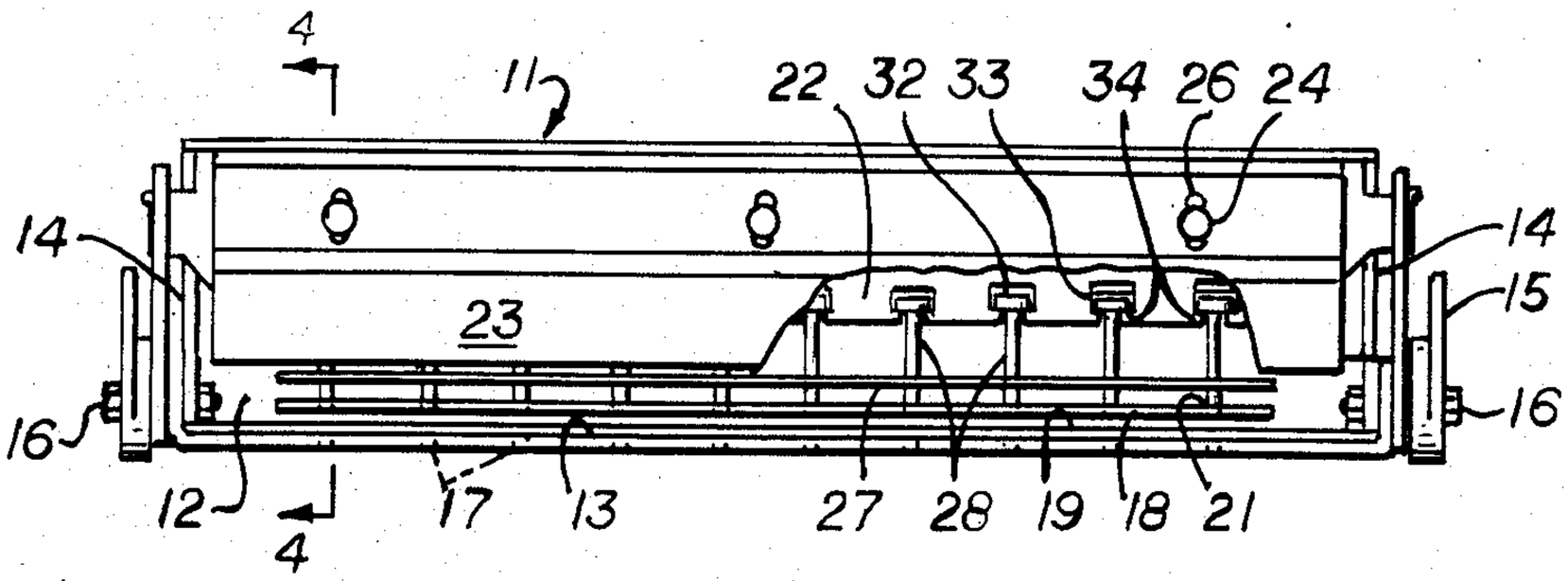



Fig. 1

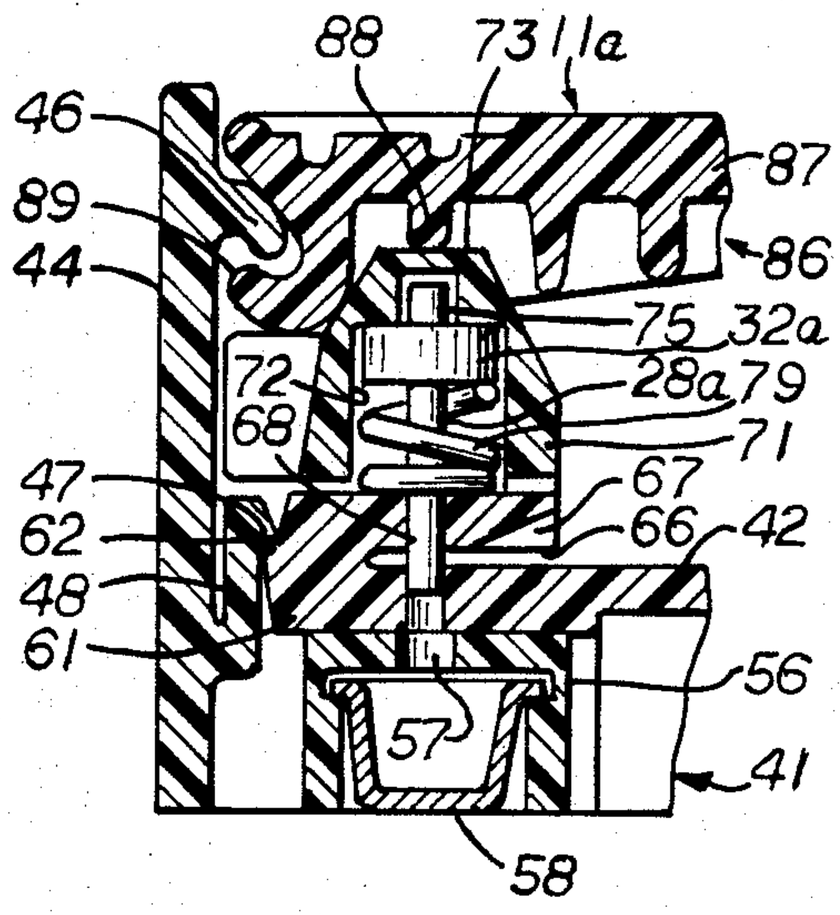



Fig. 4

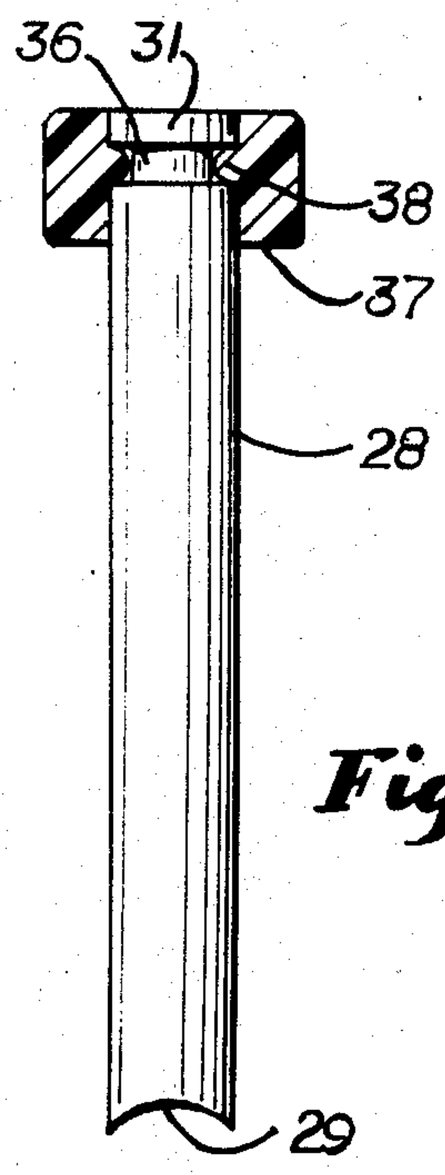



Fig. 3

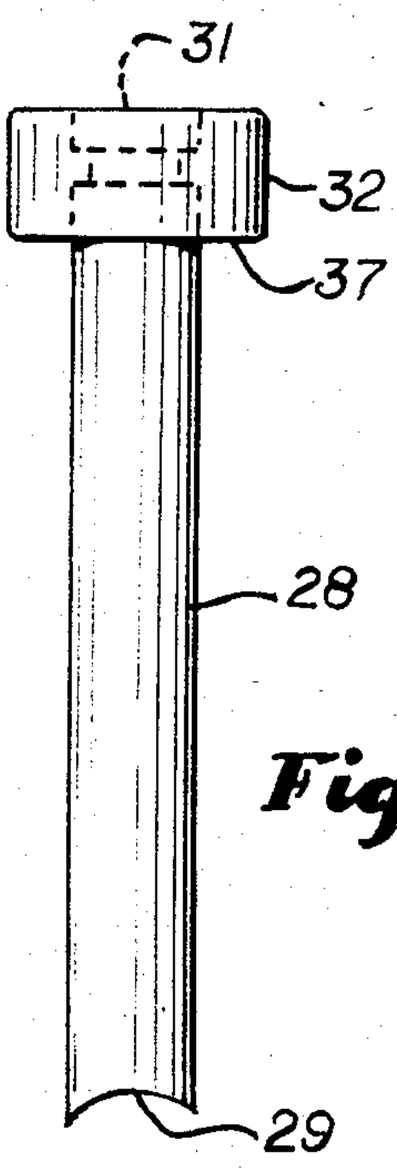



Fig. 2

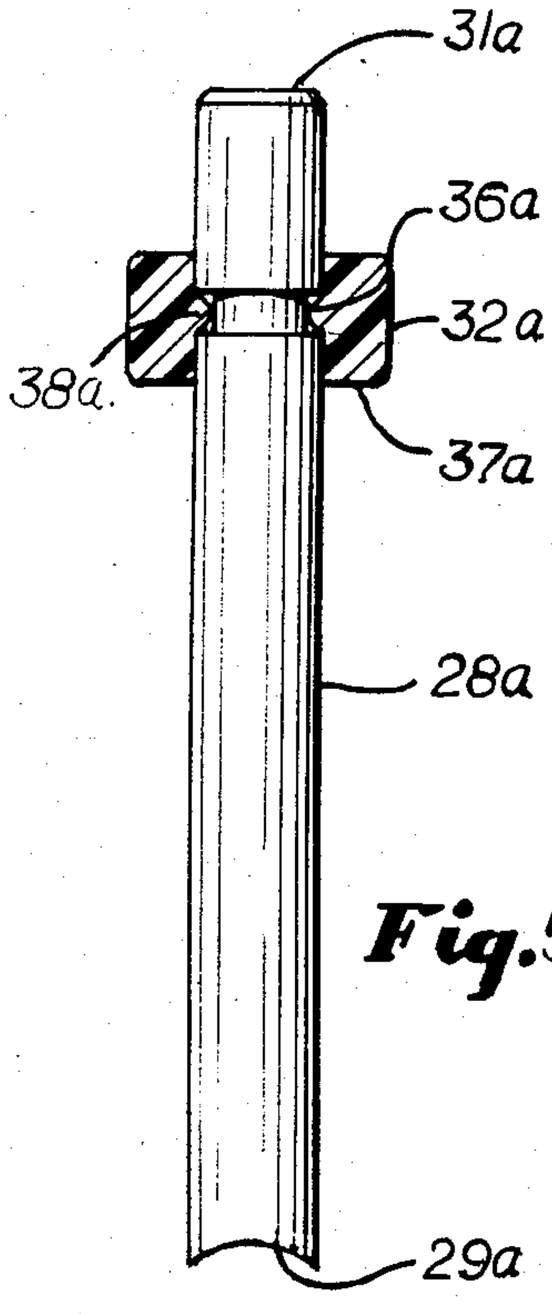



Fig. 5

# PUNCH PIN HEAD STRUCTURE

## BACKGROUND OF INVENTION

1. Field of Invention

This invention relates to a new and improved punch pin having a plastic collar molded thereon which cooperates with a spring or a retractor gripper in the punch mechanism to retract the pin after it has performed its punching operation.

2. Description of Related Art

Various means have been employed to incorporate collars in punch pins. Where the collar is located on the end of the pin, upsetting has commonly been the means of fabrication. Another type of collar has been provided by forming a circumferential groove in the pin and inserting therein a D-ring or equivalent.

The present invention provides a collar at a cost much less than upsetting the pin end and less expensive and more secure than the use of a D-ring or similar fastener.

## SUMMARY

In one form of punch illustrated generally herein, the application of force to the punch pin is at the top. The member applying force is formed with a slot having inward extending shoulders which fit under the collar on the pin. In this form of the invention, the plastic collar is molded to the pin at the upper end thereof, there being a groove formed in the pin spaced downward from its upper end into which a portion of the molded material protrudes.

In another form of punch herein illustrated, the application of force is from the end of the pin. Retraction is accomplished by a coil spring which bears against a collar spaced down from the upper end of the pin. In this form of the invention, the groove in the pin is spaced downward a greater distance than the groove in the preceding modification. However, the collar is fabricated in essentially the same manner as in the preceding modification.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawing in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

FIG. **1** is a front elevational view of one form of punch partially broken away to reveal internal construction; FIG. **2** is an enlarged elevational view of the pin of FIG. **1**;

FIG. **3** is a section thereof taken substantially along the line **3**—**3** of FIG. **1**;

FIG. **4** is a fragmentary sectional view of a portion of an alternate punch mechanism;

FIG. **5** is an enlarged elevational view of the pin used in the modification of FIG. **4** with the collar broken away in section.

## DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **1** shows a portion of the paper punch more completely illustrated and described in U.S. Pat. No. 4,079,647. Punch **11** is manually actuated by a handle (not shown) which, through linkage, causes the lever **15** to oscillate about a horizontal transverse axis. The front plate **23** of punch **11** is formed with a punch opening **12** for reception of the paper to be punched. Spaced rearwardly from the plate **23** is a horizontally extending female die plate **13** secured to side plates **14**. Holes **17** are formed in plate **13**, the number and spacing of which determines the number, spacing and size of the holes to be punched in the paper. Immediately above plate **13** is a horizontal transverse guide plate **18** and there is a gap **19** between plates **13** and **18** which limits the quantity of paper which can be punched at one time. Plate **18** is formed with holes **21** which are aligned with holes **17**.

Vertically reciprocating punch plate **22** is in vertical alignment with holes **17** and **21**. Immediately in front of plate **22** is front plate **23**. Pins **24** pass through slots **26** in the plate **13** and through plate **22** in such manner that the plate **22** may reciprocate relative to the stationary elements of the punch apparatus.

Male punch pins **28**, which are in the form of round cross-section rods, are in vertical alignment with holes **17** and **21**. The lower ends **29** of pins **28** are ground concave so as to cooperate with the holes **17** to punch paper in the gap **19**. The upper end of each pin **24** is formed with an enlarged head **32** which is received in a slot **33** in punch plate **22**. Below slots **26** are inward extending shoulders **34** integral with plate **22** which engage under the heads **32**. Thus, as plate **22** is depressed each head **32** of pin **28** is depressed by the top of slot **33** engaging the top of head **32**. Actuation of vertical reciprocation of punch plate **22** is by oscillation of crank **15** in a manner described in detail in said U.S. Pat. No. 4,079,647. Other means of reciprocation are acceptable.

Directing attention now to FIGS. **2** and **3**, it will be seen that spaced downwardly from the upper end **31** of each pin **28**, is a groove **36** which extends circumferentially around the pin. A plastic collar **37** is molded around the upper end of pin **28**, the upper surface of collar **37** being approximately at the same elevation as upper end **31** and the lower end being substantially below groove **36**. By reason of the molding process, there is an inward protrusion **38** of the collar **37** which substantially fills groove **36**. Thus collar **37** and pin **28** are secured together. Therefore, on upward movement of punch plate **22** upon reverse oscillation of crank **15**, the shoulders **34** engage under the plastic collar **37** to raise the punch pin **28** from its depressed position to its retracted position.

A suitable plastic material for collar **37** is an unfortified polycarbonate. A suitable material for the punch pin **28** is an alloy steel, suitably heat treated to a satisfactory hardness.

FIG. **4** shows another punch with which the present invention may be used. A feature of the punch shown in FIG. **4** is that it is molded of plastic material although it will be understood that a metal could be substituted. Directing attention now to FIG. **4**, a feature of the punch illustrated is that the parts may snap into place and be held assembled without the use of separate fasteners. However, although this feature has numerous advantages over prior punches, these particular features are not essential to the present invention and it will be understood that other punch structures may be used with the punch pins **28***a* hereinafter described in detail.

Punch **11***a* has a base **41** having an upwardly-rearwardly slanted platen **42** to support pages to be bound. Extending vertically upward of base **41** is a back **44**. Spaced below the top edge of back **44** are downward directed hooks **46**. Near the bottom of back **44** are catches **47** on the ends of vertically extending catch

arms **48**. Catches **47** may move forward and and rearward by reason of flexibility of arms **48**.

Extending transversely of base **41** is a support **56** in the shape of an inverted channel, having longitudinally spaced apart holes **57**, larger than the holes which the device is intended to punch. The top of support **56** is below the elevation of the rear of platen Below support **56** and fitting within its channel shap is a slup receiving receptor **58** which catches the punched circles which drop through holes **57**. Various means may be used to retain the receptor **58** within the support **56**.

Resting upon support **56** is transverse die bar **61** which has ledges **62** at its rear. Catches **47** engage ledges **62** and restrain bar **61** from being lifted.

Die bar **62** has a throat **66** formed therein which is at the level of platen **42**. The depth of throat **66** determines the distance from the rearward edge of the paper being punched that the holes formed therein are located. To assist the paper entering the throat **66**, there is a downward-rearward slanted guide **67** above the platen **42**. Bores **68** are formed in the die bar **61** extending down through the body of the die bar into registry with the holes **67**. It will be seen that the bores **68** intersect throat **66**.

Vertically reciprocating above die bar **61** is a transverse punch bar **71** having cavities **72** corresponding in number to the bores **68** formed extending upward from its bottom surface in alignment with bores **68**. Each cavity **72** has a lesser diameter upward extension **75**. The punch bar **71** has a flat top **73**.

Received in each cavity **72** is a punch pin **28***a* formed with a male punch die **29***a* at its bottom end. Near the top **31***a* of each pin **28***a* is a collar **32***a* formed of a plastic material similar to the head **32** of the preceding modification. Thus, there is a groove **36***a* formed in pin **28***a* spaced downwardly from the upper end **31***a* thereof. The plastic molded collar **37***a* has an inward protrusion **38***a* which substantially fills the groove **36***a*.

Coil springs **79** at their upper ends bear against collar **37***a*. The lower ends of the springs **79** bear against the die bar **61**. The portions of the ends **28***a* above the collar **22***a* extend into extension **75**. Hence the springs **79** bias the punch pins **28***a* upward in the cavity **72** and also bias the punch bar **71** upwardly.

In operation of the punch, the user depresses the lever **87**, causing the punch to move to the position illustrated in FIG. **4** with the punch bar **71** depressed and the punch pins **28***a* depressed to punch sheets inserted in throat **68** as has heretofore been explained. When the lever **87** is released, springs **79** return handle **86** to its upward position, the springs **79** bearing against the collar **37***a* to raise the pins **28***a*.

The pin of FIG. **5** resembles that of FIGS. **2–3** and the same reference numerals followed by subscript a designate corresponding parts.

What is claimed is:

**1**. In a punch, a first plate formed with a first hole, a guide plate spaced from said first plate by a gap, said guide plate being formed with a second hole aligned with said first hole; a punch pin, said punch pin comprising a metal rod having a first end formed as a male punch and a second end, said rod formed with a groove vicinal said second end and a plastic collar molded around said rod having a protuberance substantially filling said groove and the surface of said collar closest to said first end, having a substantially flat surface perpendicular to said rod, the thickness of said collar being substantially less than the length of said rod; said punch pin being reciprocable through said first and second holes, first means engaging said second end to push said first and through said first hole to punch paper in said gap, and second means applying force to said first-mentioned surface of said collar to retract said punch pin away from said first plate, said first means compriseing a punch plate, said punch plate being formed with a slot having an edge to engage said second end of said rod and said second means comprising shoulders on said slot engaging said flat surface of said collar.

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